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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

ED 063415

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

OPERATING ROOM TECHNICIAN (medical ser.) 0-50.015

SURGICAL TECHNICIAN (medical ser.) 0-50.015

B-508 or S-231

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U. S. Employment Service
in Cooperation with
New York and Pennsylvania State Employment Services

October 1963

GATB # 2376
2465

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

OPERATING ROOM TECHNICIAN (medical ser.) 0-50.015
SURGICAL TECHNICIAN (medical ser.) 0-50.015

B-508

Summary

The General Aptitude Test Battery was administered to two samples for the purpose of validating and cross-validating norms for the occupations of Operating Room Technician 0-50.015 and Surgical Technician 0-50.015. The year of collection of criterion data, the criterion type, and the number of individuals included in each final sample are as follows:

Sample	Year	Criterion	N
Validation (Pennsylvania)	1961	Supervisory Ratings	50
Cross-Validation (New York)	1962	Supervisory Ratings	52

GATB Norms for Operating Room Technician (medical ser.) 0-50.015 and Surgical Technician (medical ser.) 0-50.015, B-508.

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1-H CB-1-I CB-1-J	90	G	Part 3 Part 4 Part 6	85
S	CB-1-F CB-1-H	85	S	Part 3	80
M	CB-1-M CB-1-N	95	M	Part 9 Part10	90

Effectiveness of Norms

Validation Sample

Only 62 percent of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 81 percent would have been good workers. 38 percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 19 percent would have been poor workers.

Cross-Validation Sample

Only 69 percent of the non-test-selected workers used for this study were good workers; if the workers had been test-selected with the above norms, 78 percent would have been good workers. 31 percent of the non-test-selected workers used for this study were poor workers; if the workers had been test-selected with the above norms, only 22 percent would have been poor workers.

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Operating Room Technician 0-50.015 and Surgical Technician 0-50.015.

II. Sample

Validation Sample (Pennsylvania

The General Aptitude Test Battery, B-1002A was administered during the period December 21, 1958 to April 27, 1961 to a sample of 50 workers (49 female and 1 male) employed as Operating Room Technicians 0-50.015 at Mercy Hospital (18 workers) and Western Pennsylvania Hospital (32 workers), both located in Pittsburgh, Pennsylvania. All of the individuals in the sample were experienced and comprised the total work force in this occupation at these hospitals. Applicants for employment are interviewed to determine their neatness, responsiveness, maturity and interest. Tests are not used in selection for employment. Inexperienced workers are given a six month in-service training course. All individuals in the sample have completed the minimum training period.

TABLE I-A

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

Validation Sample (Pennsylvania)

N = 50	M	σ	Range	r
Age (years)	22.9	5.9	19-53	.035
Education (years)	12.0	0.7	9-15	.371**
Experience (months)	16.5	14.0	6-60	.267

*Significant at the .01 level

Cross-Validation Sample (New York)

The GATB, B-1002B was administered on May 17-18, 1962 to a final sample of 52 workers (51 female and 1 male) employed as Operating Room Technician 0-50.015 at four hospitals in Buffalo, New York.

TABLE I-B

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

Cross-Validation Sample (New York)

N = 52	M	σ	Range	r
Age (years)	28.3	9.4	18-51	-.024
Education (years)	11.6	1.1	8-14	.271
Experience (months)	37.2	37.1	2-173	.042

III. Job Description

Job Title: Operating Room Technician (medical ser.) 0-50.015
Surgical Technician (medical ser.) 0-50.015

Job Summary: Serves as part of a surgical team in the operating room of a large general hospital, performing a variety of duties as either scrub technician or circulating technician. Checks equipment and prepares operating room for survey, assists surgeons and other personnel in the performance of the surgery and adjusts and arranges room and equipment following operation preparatory to further use. The operating room technician may occupy several positions on the surgical team. In all cases there will be one serving as scrub technician, directly assisting the surgeons, and one serving as circulating technician, getting additional supplies and equipment and generally serving the team as a whole.

Work Performed: Prepares self and room for surgery: As scrub technician prepares self by donning scrub dress or scrub suit, surgical mask and cap; damp dusts operating room and checks lights and electrical equipment to assure proper functioning so that risk of malfunctioning during surgery is minimized. Performs a complete scrub according to established procedure; dons sterile gown and sterile gloves to begin establishing sterile nature of activity; distributes contents of laparotomy pack which has been placed on instrument table by circulating technician.

Removes tray of instruments from autoclave by grasping handles on either side of tray with towel and places tray on instrument table. Removes instruments from tray and places them on Mayo stand so that they are ready for immediate use as required by surgeon. Places proper knife blades on knife handles. Makes a count of sponges together with surgeon and reports number to the circulating technician so that a record is established of number of sponges used in surgery compared with count made subsequent to surgery.

As circulating technician, prepares self by dressing in scrub dress and assists in preparing operating room. Assists scrub technician in obtaining necessary supplies and equipment, being careful not to touch anything sterile since circulating technician is not sterile. Identifies and transports patient from waiting area to operating room or assists in this activity; assists in moving patient and positioning patient in accordance with prescribed position for particular surgery involved. Coordinates activities with scrub technician to assist in protecting the sterile area. Obtains additional equipment and supplies as requested by any member of surgical team. Assists surgeons in performing operations: As scrub technician, positions self by instrument table so that all surgical instruments are easily accessible. Anticipates surgeon's needs to the extent possible. Provides instruments and supplies to surgeon either in anticipation of his needs or at his request places instrument in surgeon's hand in the position he is going to use it so that he will not have to make any readjustment. Handles needles and sutures in same manner. Receives used instrument from surgeon, exercising care so that soiled

instruments do not contaminate sterile nature of other instruments and supplies. Notifies circulating technician of additional supplies needed. Observes activity at all times for breaks in sterile technique. May change gloves if possibility exists of punctures and/or cuts in gloves; may inform other members of team of similar breaks in sterile technique. Performs any related duties as requested by surgeon.

Labels, preserves and forwards operative specimens for laboratory analysis. May provide surgical team with special equipment such as cauteries to aid in progress of surgery; may provide fluids such as saline, as needed by surgical team.

Readjusts room and equipment during and after final stages of surgery: Prepares final dressing so that it is ready when needed. Removes unused linens and related supplies from instrument table and places them on bottom of shelf table. Checks by shaking and examining all soiled linens and drapes to assure that no equipment is sent to laundry. Removes equipment to utility room. Discards soiled linens in hamper for laundry, takes basins and Mayo stand to utility room and brings empty Mayo stand back for next case. Assists with adhesive in final dressing as requested. Reidentifies patient carriage to assure proper carrier for transportation to recovery room; assists in transferring patient to the cart, assuring that patient is properly positioned. Checks to determine that patient is cleaned of all blood and/or other matter prior to return to recovery room.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the validation sample (Pennsylvania) and all the tests of the GATB, B-1002B, were administered to the cross-validation sample (New York).

V. Criterion

Validation Sample (Pennsylvania)

The criterion consisted of one set of supervisory ratings made on USES Form SP-21, "Descriptive Rating Scale," during the period November 25, 1959 through May 15, 1961. This rating scale consists of nine items covering different aspects of job performance, with five alternatives for each item. Weights of one through five, indicating the degree of job proficiency attained, were assigned to the alternatives. The range of final criterion scores is 16-45 with a mean of 28.8 and a standard deviation of 7.2. Since only one set of rating scale scores was obtained for this study, an estimate of criterion reliability was made by obtaining the relationship between the total rating scale scores and scores on item "I"(all around ability) of the scale. A reliability coefficient of .88 was obtained.

Cross-Validation Sample (New York)

The criterion data collected consisted of two sets of independent ratings made by the first-line supervisor on an adaptation of USES Form SP-21, "Descriptive Rating Scale." A period of at least one month elapsed between the first and second ratings. The rating scale consisted of eight items covering different aspects of job performance, with five alternatives for each item. Weights of one through five, indicating the degree of job proficiency attained, were assigned to the alternatives. A reliability coefficient of .79 was obtained for the criterion. Therefore, the two sets of ratings were averaged, resulting in a distribution of final criterion scores of 12-40 with a mean of 28.0 and a standard deviation of 5.3.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Intelligence (G) - required to successfully pass training course in theory and practical application, and to follow established procedures and instructions *in performing wide variety of duties in working with* surgical team.

Form Perception (P) - required to differentiate among the variety of surgical instruments with regard to type, shape, and size.

Motor Coordination (K) - required to quickly and deftly supply surgical team with instruments.

Finger Dexterity (F) - required to thread materials through needles and in handling and fingering certain equipment and instruments.

Manual Dexterity (M) - required to make a variety of movements with arms and hands when handling instruments, grasping and holding bulky supplies, and when adjusting and fitting equipment in proper order.

On the basis of the job analysis data, Aptitudes V-Verbal Aptitude and N-Numerical Aptitude were rated "irrelevant" for successfully performing the duties of this job.

B. Quantitative Analysis: Validation Sample (Pennsylvania)

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 50

Aptitudes	M	σ	r
G-Intelligence	100.7	14.5	.366**
V-Verbal Aptitude	103.9	13.8	.266
N-Numerical Aptitude	96.5	16.1	.316*
S-Spatial Aptitude	101.2	18.0	.329*
P-Form Perception	110.1	15.2	.263
Q-Clerical Perception	114.1	16.1	.353*
K-Motor Coordination	109.4	16.3	.235
F-Finger Dexterity	108.0	16.8	.225
M-Manual Dexterity	105.3	16.3	.300*

**Significant at the .01 level
*Significant at the .05 level

C. Selection of Test Norms:
Validation Sample (Pennsylvania) TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	X				X		X	X	X
Irrelevant		X	X						
Relatively High Mean					X	X	X		
Relatively Low Sigma	X	X							
Significant Correlation with Criterion	X		X	X		X			X
Aptitudes to be Considered for Trial Norms	G			S	P	Q	K		M

Trial norms consisting of various combinations of Aptitudes G,S,P,Q,K and M with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1002 norms consisting of G-85, S-80 and M-90 had the best selective efficiency.

VII. Validity of Norms (Concurrent)

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 38 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes G, S and M with critical scores of 85, 80 and 90 respectively, and the dichotomized criterion for the validation sample (Pennsylvania). Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms
(G-85, S-80, M-90)

N = 50	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	5	26	31
Poor Workers	13	6	19
Total	18	32	50

Phi Coefficient = .53
χ^2 = 13.990
P/2 < .0005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Cross-Validation of Norms

Table V shows the relationship between test norms consisting of Aptitudes G, S and M with critical scores of 85, 80 and 90 respectively, and the dichotomized criterion for the cross-validation sample (New York). Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE V

Cross-Validation of Test Norms
(G-85, S-80, M-90)

N = 52	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	28	36
Poor Workers	8	8	16
Total	16	36	52

Phi Coefficient = .28
χ^2 = 4.019
P/2 < .025

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

IX. Conclusions

On the basis of the results of this study, Aptitudes G, S, and M with minimum scores of 85, 80 and 90, respectively, have been established as B-1002 norms for Operating Room Technician 0-50.015 and Surgical Technician 0-50.015. The equivalent B-1001 norms consist of G-90, S-85 and M-95.

X. Determination of Occupational Aptitude Pattern

The data for this study did not meet the requirements for incorporating the occupation studied into any of the 35 OAP's included in Section II of the Guide to the Use of the General Aptitude Test Battery, January 1962. The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.